

Application No.: 10/809,657
Docket No.: PE0667 US DIV3

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Remarks

Status of the Application

Claims 1-7, 9, 13-17 and 19-21 are now pending. Claims 1, 13 and 21 are amended.

The claims are amended to address the objections to claims raised by the Examiner. The Applicants wish to thank the Examiner for the helpful guidance offered by the suggestions in the Office Action.

Claims 1 and 21 are also amended to specify that the copolymer can not consist of 9,9-di-n-octyl and unsubstituted naphthalene alternating copolymer to advance the prosecution on the merits.

The pending claims stand objected to for cited informalities. Also, the pending claims stand rejected under 35 U.S.C. § 102(b) in separate rejections based on four references.

Claim Objections

The claim objections have been addressed in the amendments per the Examiner's suggestions. Applicants respectfully submit that the objections have now been overcome and that the rejections may be withdrawn.

Claim Rejections – 35 U.S.C. § 102

The four separate rejections will be addressed independently below.

Inbasekaran

Inbasekaran, U.S. patent No. 5,777,070, discloses a conjugated alternating polymer containing a repeating dimer wherein a fluorene group may be identified as the A component of the dimer and an aryl group "Ar" may be designated as the B component of the dimer. Please see the following discussion.

To anticipate claims under review, the single prior art reference must disclose each and every limitation in the claims, in the order therein presented, and must enable the claimed invention. Inbasekaran discloses in Example 3 an alternating copolymer of the general formula -A-B-A-B-A-B-A-B-A-B- in which A represents the fluorene comonomer and B represents the unsubstituted anthracene comonomer. In effect, this is apparently a repeating dimer that produces a strictly alternating copolymer of the general formula indicated above. The claims are not limited to strictly alternating copolymers of this general formula. Nor does Inbasekaran disclose more than one A or more than one B comonomer, or the comonomers of Formula I with R substituents other than alkyl or the comonomers of Formula I(a) or the other comonomers of substituted Formula VI or substituted or unsubstituted Formulae VII and VIII. In addition, Applicants have amended claims 1 and 21 to specify that the copolymer cannot be

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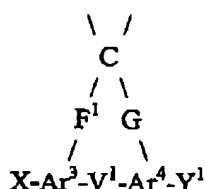
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an alternating copolymer of 9,9-di-n-octylfluorene and unsubstituted naphthalene. Accordingly, this rejection should be withdrawn.

Kreuder

Kreuder, U.S. Patent No. 5,763,636, discloses a general formula (I) for a conjugated polymer including a spiro linkage (see claim 1, Col. 18, lines 35-40). Kreuder also identifies his polymers as containing spiro atoms (Abstract, formula (I)) and a plurality of spiro centers (Col. 2, lines 30-40). The examples of spiro-containing species shown at Col. 3, lines 35-45 and 50-55 are *excepted from* the disclosure (see Col. 3, lines 28-30). Spiro-containing compounds of the Kreuder disclosure are shown as structures in Examples 7, 8, 9 and 10. All of the other working examples (Examples 1 - 6) describe spiro-containing polymers or compositions. The copolymers of the present claims can only form spiro compounds if the adjacent R groups that are pendant from the central ring of the fluorene structure of Formula I form a 5- or 6- membered cycloalkyl, aryl or heteroaryl ring. Please see claim 1.

Kreuder's formula (I) discloses the spiro-containing SRU as shown below, in relevant part. In the scheme below, C is the spiro atom, F¹ and G are -CR¹R¹-, -O-, -S-, -NR³- or a chemical bond, Ar³ and Ar⁴ are defined at Col. 2, lines 43-53, V¹ is -CR⁵=CR⁶-, -CR⁷R⁸-, -CR⁹R¹⁰-, -CR¹¹R¹²-, -NR³-, SiR¹⁴R¹⁵-, -O-, -S-, -So-, SO₂-, -CO-, or a chemical bond (Col. 2, lines 54-57), and X and Y¹ are alike or different, cyclic or acyclic, conjugated hydrocarbons having from 2-100 (preferably 2-20) carbon atoms, which can also contain heteroatoms such as N, O, and/or S, and which can be substituted by one or more radicals, and can be H (Col. 2, lines 58-64):



The top portion of the SRU is capped at either end by -[Ar⁵]_n- and -[Ar⁶]_p-. Please see in general Col. 2, lines 26-64.

Ar³ and Ar⁴ are *always* -triyl (trivalent) whether they are aromatic or alicyclic, heteroaromatic or heterocyclic (please see Col. 2, lines 43-53 and associated text in claims 1 and 9) so that the pendant spiro unit in all of Kreuder's molecules is tricyclic in every instance. These are exemplified by the structures associated with Examples 7 - 10 and with

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the nomenclature of the other working examples. In the instances in which a monomer of a copolymer of the claims under review forms a spiro compound, there is pendant only a single ring, by definition in, e.g., claim 1, "adjacent R groups can form a 5- or 6- membered * * * ring" and R¹ by definition is a substituent on an R group and R¹ does not, by definition, form additional rings.

Therefore, this rejection is respectfully traversed on the grounds that Kreuder does not disclose compounds of the invention, but rather discloses spiro compositions in which both moieties according to Kreuder's formula (I) and definitions have tricyclic systems joined by a spiro linkage. This does not occur in the claimed compositions, where spiro monomers have a monocyclic pendant system. In addition, the present claims address copolymers in which one or more monomers are selected from Formulae I and I(a) (the latter of which does not contain a spiro linkage) and one or more monomers selected from Formula VI, VII and VIII. Kreuder discloses conjugated polymers where the monomers are derivatives of formula (I). Therefore, even if Kreuder discloses anthracene or pyrene as the comonomer, the structure of the repeating unit is still fundamentally different than the claimed structures. Applicants respectfully submit that this rejection should be withdrawn.

Kim '864

Applicants respectfully traverse this rejection. Kim, U.S. Patent No. 5,876,864, discloses a polymer described in the Abstract as a fluorene-based alternating polymer. In the general formula shown above, A may be designated as the fluorene component and B the aryl ("Ar") component, so that the alternating copolymer is apparently actually a repeating dimer of -A-B-.

The present claims are directed to a copolymer having at least one fluorene-based comonomer having Formula I or Formula I(a) and at least one comonomer having Formulae VI, VII, or VIII (please see, e.g., claim 1). In Kim '864, as shown in formula (I) the basic structural repeat unit (SRU) or backbone of the alternating polymer includes $\text{--}\equiv\text{Ar--}$ where Ar represents substituted or unsubstituted phenyl and is illustrated in the formulae shown at Col. 4, line 50 to Col. 7, line 5, as well as the acetylene group on each end of the SRU. Kim '864 does not disclose a polymer other than a strictly alternating pattern as depicted above. Table 1, Cols. 15-16 presents the chemical structures of polymers from Kim's working examples. All contain two acetylenic (ethynic) groups in the SRU; these are absent from any claimed copolymer and therefore the SRUs of Kim the SRUs in the claims under review are different, no matter how the various possible combinations are arranged. In addition, Kim '864 does

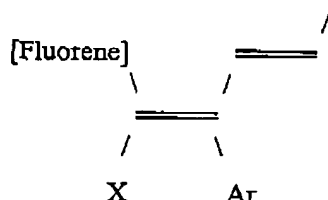
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not show any substitution on the phenyl rings of the fluorene comonomer, as do the claims under review. For these reasons, Kim '864 does not anticipate the pending claims. Applicants respectfully request that this rejection be withdrawn.

Kim '974

This rejection is also respectfully traversed. Kim, U.S. Patent No. 5,807,974 also discloses a fluorene-based alternating copolymer (Abstract). Formula (I) in Kim '974 depicts an SRU that contains a fluorene group and a side chain as the two components of the repeating dimer,



In the schematic shown in the previous section discussing Inbasekaran (-A-B-A-B-), the fluorene group can be identified with A and the diene having pendant -X and -Ar may be identified as B. There is no such component in the present claims that corresponds with the disubstituted dienyl B unit shown above.

Simply stated, there is no equivalent side chain in any of the present claims. Like Kim '864, Kim '974 lacks any disclosure of a comonomer such as the claimed second monomer based on Formulae VI - VIII. Even if Kim '974 discloses Ar = naphthalene or anthracene, the SRU is still fundamentally different in structure and components from those claimed in the application. The -Ar thus described in Kim '974 does not constitute a comonomer, but rather a pendant group that is a constituent of the comonomer. For these reasons, Kim '974 does not anticipate the pending claims. Applicants respectfully request that this rejection be withdrawn.

Conclusion

Applicants respectfully submit that a fully responsive paper is provided herein and that all pending objections and rejections have been overcome or rendered moot by the foregoing amendments and remarks. Accordingly, Applicants respectfully assert that the pending claims are in condition for allowance, and earnestly solicit a notice of allowance.

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Respectfully submitted,



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